



AMD-K6[®] Processor

V_{CC2} Voltage Detection

Application Note

Publication # 21635	Rev: D	Amendment/0
Issue Date: November 1998		

This document contains information on a product under development at Advanced Micro Devices. The information is intended to help you evaluate this product. AMD reserves the right to change or discontinue work on this proposed product without notice.

© 1998 Advanced Micro Devices, Inc. All rights reserved.

Advanced Micro Devices, Inc. (“AMD”) reserves the right to make changes in its products without notice in order to improve design or performance characteristics.

The information in this publication is believed to be accurate at the time of publication, but AMD makes no representations or warranties with respect to the accuracy or completeness of the contents of this publication or the information contained herein, and reserves the right to make changes at any time, without notice. AMD disclaims responsibility for any consequences resulting from the use of the information included in this publication.

This publication neither states nor implies any representations or warranties of any kind, including but not limited to, any implied warranty of merchantability or fitness for a particular purpose. AMD products are not authorized for use as critical components in life support devices or systems without AMD’s written approval. AMD assumes no liability whatsoever for claims associated with the sale or use (including the use of engineering samples) of AMD products, except as provided in AMD’s Terms and Conditions of Sale for such products.

Trademarks

AMD, the AMD logo, K6, and combinations thereof, and AMD-K5 are trademarks, and AMD-K6 is a registered trademark of Advanced Micro Devices, Inc.

Other product names used in this publication are for identification purposes only and may be trademarks of their respective companies.

Contents

Revision History	v
Why Use Voltage Detection?	1
Signal Descriptions	2
Design Examples	3
What About Motherboards Without Voltage Detection?	6

List of Figures

Figure 1. VCC2H/L# Design Example	4
Figure 2. PLD Auto-Select Design Example	5

List of Tables

Table 1. Summary of Volt Detection Signal States for the AMD-K6 [®] Desktop Family	2
Table 2. Solution States of the VCC2DET Detection Example . . .	4
Table 3. Input States for Auto-Select PAL Solution	6

Revision History

Date	Rev	Description
Jan 1998	A	Initial release under a non-disclosure agreement.
March 1998	B	Initial published release.
May 1998	C	Added AMD-K6 [®] processor Model 8 information to Table 1 on page 2 and Table 3 on page 6.
Nov 1998	D	Revised Table 1, "Summary of Volt Detection Signal States for the AMD-K6 [®] Desktop Family," on page 2.

Application Note

AMD-K6[®] Processor V_{CC2} Voltage Detection

Unless otherwise noted, the information in this application note pertains to all processors in the AMD-K6[®] desktop family, which includes the AMD-K6 processor (Models 6 and 7) and the AMD-K6-2 (Model 8).

Why Use Voltage Detection?

With the increasing number of different processor types in the market, it becomes increasingly difficult to know which processors require what voltages—5 volt vs. 3 volt? 3.3 volt vs. 3.45 volt vs. 3.54 volt? Single voltage vs. dual voltage? The list goes on and on. Because of this confusion, many processors are often damaged due to electronic over-stress when powered with incorrect voltage settings. By implementing voltage detection, system logic can ensure that safe and appropriate voltage levels are supplied to the processor during system power-up, which helps prevent over-stress damage to processors.

The AMD-K6[®] processor family is designed to indicate to system logic its specified dual-voltage supply requirements. For those systems that support voltage detection, the implementation by AMD of V_{CC2} Detect (VCC2DET) and V_{CC2} High/Low (VCC2H/L#) allows protection against electronic over-stress. This design enhancement is for protection purposes only.

Signal Descriptions

The AMD-K6 processor Models 7 and 8 support voltage detection through the implementation of VCC2 Detect (VCC2DET) and VCC2 High/Low (VCC2H/L#). These signals are both tied to V_{SS} (logic level 0) to indicate to the system logic that it must supply the specified dual-voltage requirements to the V_{CC2} and V_{CC3} pins. The V_{CC2} pins supply voltage to the processor core, independent of the voltage supplied to the I/O buffers on the V_{CC3} pins. Upon sampling VCC2DET Low to identify dual-voltage processor requirements, system logic should sample VCC2H/L# to identify the core voltage requirements of 2.9V and 3.2V products (High) and 2.2V products (Low).

The AMD-K6 processor Model 6 (0.35- μ m process technology) supports voltage detection through the implementation of VCC2DET. VCC2DET is internally tied to V_{SS} (logic level 0) to indicate to the system logic that it must supply the specified dual-voltage requirements to the V_{CC2} and V_{CC3} pins. The VCC2H/L# signal is not implemented in the AMD-K6 processor Model 6, and this pin is designated as an Internal No Connect (INC). To prevent the system logic from misinterpreting this floating INC pin as a Low, system logic that samples VCC2H/L# must incorporate a weak pullup resistor for this signal. Some system implementations may, however, satisfy the need for a weak pullup resistor by design, see “VCC2H/L# Solution” on page 4. Table 1 summarizes the states of the voltage detection signals for the AMD-K6 desktop family.

Table 1. Summary of Volt Detection Signal States for the AMD-K6[®] Desktop Family

AMD-K6 [®] Processor Family	V_{CC2} Requirement	VCC2DET	VCC2H/L#	Notes
AMD-K6-166 (Model 6)	2.9V	Low	Floating	1, 2
AMD-K6-200 (Model 6)	2.9V	Low	Floating	1, 2
AMD-K6-233 (Model 6)	3.2V	Low	Floating	1, 2
Notes: <ol style="list-style-type: none"> 1. The AMD-K6 processor Model 6 requires a weak pullup resistor to provide a High detection of the VCC2H/L# signal. 2. Additional logic may be designed to adjust the core voltage to 2.9V or 3.2V based on the determined processor frequency. Otherwise, jumper settings are required to fine-tune the supplied voltage. 3. “xxx” represents the operating frequency. 				

Table 1. Summary of Volt Detection Signal States for the AMD-K6[®] Desktop Family (continued)

AMD-K6 [®] Processor Family	V_{CC2} Requirement	VCC2DET	VCC2H/L#	Notes
AMD-K6/xxx (Model 7)	2.2V	Low	Low	3
AMD-K6-2/xxx (Model 8)	2.2V	Low	Low	3
Notes: <ol style="list-style-type: none"> 1. The AMD-K6 processor Model 6 requires a weak pullup resistor to provide a High detection of the VCC2H/L# signal. 2. Additional logic may be designed to adjust the core voltage to 2.9V or 3.2V based on the determined processor frequency. Otherwise, jumper settings are required to fine-tune the supplied voltage. 3. "xxx" represents the operating frequency. 				

Design Examples

The following design examples illustrate how to utilize the AMD-K6 processor voltage detection signals in system logic to prevent electronic over-stress. However, these examples do not provide a complete voltage supply solution. In fact, most voltage detection designs do not completely calibrate the supply voltage to the specified requirement, in which case additional jumper settings may be required to fine-tune the supplied V_{CC2} voltage.

VCC2DET Solution

The detection of VCC2DET is implemented to ensure the processor powers up in dual-voltage mode. The following logic example can be used for this purpose:

The supplied processor core voltage (V_{CC2}) is first compared with a desired reference voltage (3.3V). The result of this comparison is then exclusively ORed with the VCC2DET pin. Finally, the output of this detection logic controls the processor voltage supply source through the shutdown or enable pin of the regulator.

Table 2 on page 4 shows the solution states for this VCC2DET detection example. Dual voltage is supplied only when V_{CC2} is less than or equal to the reference voltage and VCC2DET is Low. Single voltage is supplied only when V_{CC2} is higher than the reference voltage and VCC2DET is High. Otherwise, the core voltage regulator is disabled.

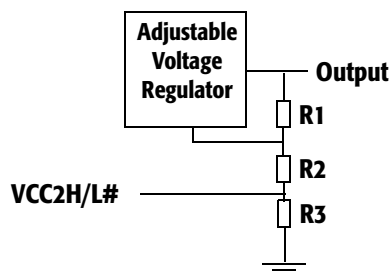
Table 2. Solution States of the VCC2DET Detection Example

V_{CC2} vs. Reference	VCC2DET Pin	Logic Detection Output	Voltage Supply	Processor Supported
High ($V_{CC2} < \text{Ref}$)	Low	High	dual-voltage	AMD-K6 [®] processor
Low ($V_{CC2} > \text{Ref}$)	Low	Low	disabled	n/a
High ($V_{CC2} < \text{Ref}$)	High	Low	disabled	n/a
Low ($V_{CC2} > \text{Ref}$)	High	High	single-voltage	AMD-K5 [™] processor

VCC2H/L# Solution

In conjunction with detecting VCC2DET, VCC2H/L# is implemented to ensure the processor powers up at an appropriate V_{CC2} voltage level. The following logic example can be used for this purpose:

VCC2H/L# is connected to a voltage-divide resistor circuit to control an adjustable voltage regulator. When VCC2H/L# is Low, resistor R3 is bypassed (shorted to GND) to provide the desired low voltage (2.2V). If VCC2H/L# is not grounded, the complete resistor circuit is utilized to provide the desired high voltage (2.9V). In this example, a weak pullup resistor is not required for the VCC2H/L# signal because the resistor circuit serves as the required pullup. Figure 1 illustrates this design example below.


Figure 1. VCC2H/L# Design Example

Auto-Select PLD Solution

The VCC2DET, VCC2H/L#, and BF1 pins can be used as Programmable Logic Device (PLD) inputs to auto select the proper voltage for a complete range of processors. The outputs of the PLD become inputs to the Voltage ID pins of the switching voltage regulator. An external jumper (or jumpers) can be used to add design flexibility and to differentiate between the AMD-K6 processor and competitor processor configuration requirements.

Figure 2 illustrates the auto-select PLD example using an AMPAL16V8 PLD. Table 3 on page 6 shows input states for auto selecting the proper voltages for the AMD-K6 processor family.

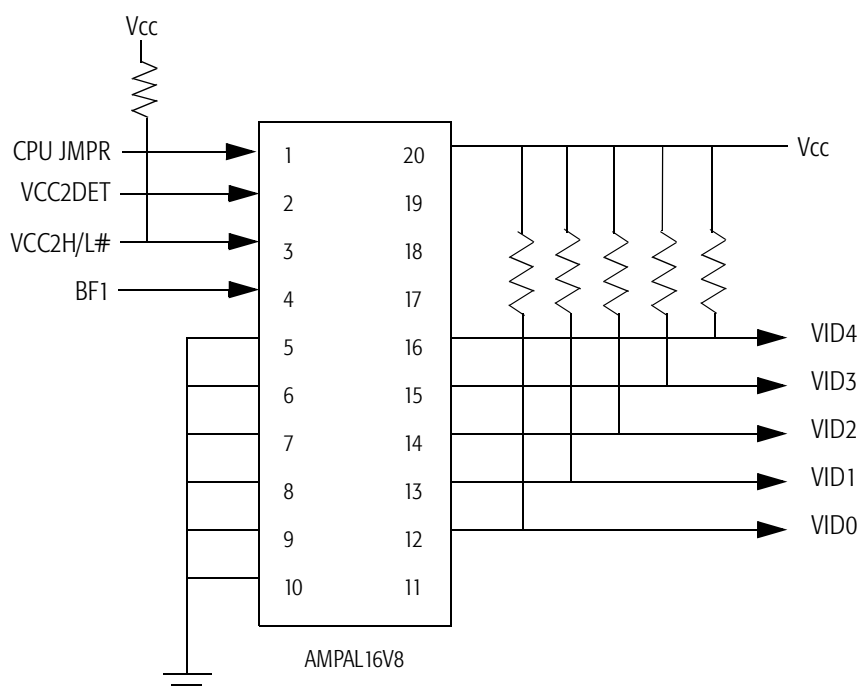


Figure 2. PLD Auto-Select Design Example

Table 3. Input States for Auto-Select PAL Solution

CPU JPMR Selection	VCC2DET	VCC2H/L#	Core Voltage	Processor	BF1	VID4	VID3	VID2	VID1	VID0
AMD	Low	High (see note)	3.2V	AMD-K6 [®] Model 6 233	High	1	0	0	1	1
AMD	Low	High (see note)	2.9V	AMD-K6 Model 6 200/166	Low	1	0	1	1	0
AMD	Low	Low	2.2V	AMD-K6 Model 7 or Model 8	X	1	1	1	0	0
AMD	High	Low	Not Valid	Not valid	X	X	X	X	X	X
Other	X	X	X	X	X	X	X	X	X	X
Note: The AMD-K6 processor Model 6 requires a weak pullup resistor to provide the High detection of the VCC2H/L# signal.										

What About Motherboards Without Voltage Detection?

Voltage detection is recommended but is not required. Unfortunately, many motherboards do not implement voltage detection logic, in which case, there is no protection against incorrect voltage configurations. Motherboards without such logic should be well-marked to identify the correct voltage settings for all AMD-K6 processors. In addition, user manuals should be well-documented to caution users and to stress the importance of configuring correct voltage settings.

For motherboards that do not have volt detection logic, the correct voltage settings for your specific model of AMD-K6 processor should be verified by reviewing the motherboard user's manual before powering up the system.